

## **RS-002, "PROCESSING APPLICATIONS FOR EARLY SITE PERMITS"**

### **ATTACHMENT 2**

#### **2.1.3 POPULATION DISTRIBUTION**

##### **REVIEW RESPONSIBILITIES**

Primary - Probabilistic Safety Assessment Branch (SPSB)

Secondary - Emergency Preparedness and Plant Support Branch (IEPB)

##### **I. AREAS OF REVIEW**

The SPSB reviews the population data in the site environs as presented in the applicant's site safety assessment, to determine whether the exclusion area, low population zone and population center distance for the site comply with the requirements of 10 CFR Part 100 (Ref. 1) to determine whether the population density is such [as given in Position C.4 of Regulatory Guide 4.7, "General Site Suitability Criteria for Nuclear Power Stations" (Ref. 2)] that consideration should be given by the applicant to alternate sites with lower population density.

A secondary review is performed by the IEPB and the written results are used by SPSB to complete the overall evaluation of the facility. The IEPB determines, as a primary review responsibility for Section 13.3 of this review standard, whether the population distribution presents any physical characteristics unique to the proposed site that could pose a significant impediment to the development of emergency plans.

##### **II. ACCEPTANCE CRITERIA**

SPSB acceptance criteria are based on meeting the relevant requirements of the following regulations:

1. 10 CFR 52.17 as it relates to having each applicant provide a description and safety assessment of the site, with special attention to the site evaluation factors identified in 10 CFR Part 100.
2. 10 CFR 52.17 as it relates to emergency planning requirements.
3. 10 CFR Part 100, Subpart B as it relates to determining the acceptability of a site for a power or testing reactor. The staff will take the following item, among others, into consideration: Population density and use characteristics of the site environs, including the exclusion area, low population zone, and population center distance.

The regulations at 10 CFR 100.3 also provide definitions and other requirements for determining an exclusion area, low population zone, and population center distance.

The applicable requirements of 10 CFR 52.17, 10 CFR Part 50, and 10 CFR Part 100 are deemed to have been met if the population density and use characteristics of the site meet the following:

1. Either there are no residents in the exclusion area, or if so, such residents are subject to ready removal, in case of necessity.
2. The specified low population zone is acceptable if it is determined that appropriate protective measures could be taken in behalf of the enclosed populace in the event of a serious accident.
3. The population center distance (as defined in 10 CFR Part 100) is at least one and one third times the distance from the reactor to the outer boundary of the low population zone.
4. The population center distance is acceptable if there are no likely concentrations of greater than 25,000 people over the lifetime of a nuclear power plant or plants of specified type (or falling within a plant parameter envelope [PPE]) that might be constructed on the proposed site (plus the term of the early site permit [ESP]) closer than the distance designated by the applicant as the population center distance. The boundary of the population center shall be determined upon considerations of population distribution. Political boundaries are not controlling.
5. The population data supplied by the applicant in the safety assessment are acceptable if (a) they contain population data for the latest census, projected year(s) of startup of a nuclear power plant or plants of specified type (or falling within a PPE) that might be constructed on the proposed site (such date or dates reflecting the term of the ESP) and projected year(s) of end of plant life, all in the geographical format given in Section 2.1.3 of Reference 3; (b) they describe the methodology and sources used to obtain the population data, including the projections; (c) they include information on transient populations in the site vicinity; and (d) the population data in the site vicinity, including projections, are verified to be reasonable by other means such as U.S. Census publications, publications from State and local governments, and other independent projections.
6. If the population density at the ESP stage exceeds the guidelines given in Position C.4 of Regulatory Guide 4.7, special attention to the consideration of alternative sites with lower population densities is necessary. A site that exceeds the population density guidelines of Position C.4 of Regulatory Guide 4.7 can nevertheless be selected and approved if, on balance, it offers advantages compared with available alternative sites when all of the environmental, safety, and economic aspects of the proposed and alternative sites are considered.

### III. REVIEW PROCEDURES

Selection and emphasis of various aspects of the areas covered by this section of this review standard will be made by the reviewer on each case. The judgment on the areas to be given attention during the review is to be based on an inspection of the material presented, the similarity of the material to that recently reviewed on other nuclear power plants, and whether items of special safety significance are involved. Determine that the population data contained in the safety assessment are in the detail and in the format described in Reference 3, Section 2.1.3.

Compare the population data presented in the safety assessment against whatever independent population data are available (e.g., Census Bureau internet data/CD-ROMs/DVDs from the decennial Census of Population and Housing, special census which may have been conducted, local and State agencies, councils of government, etc.). Note any significant differences which need clarification.

Compare the safety assessment population projections against whatever independent population projections are available (e.g., local and State agencies and Councils of Government, Census Bureau projections, Bureau of Economic Analysis, etc.). Note any significant underestimates in the safety assessment which need clarification.

At the ESP stage, use the population and its distribution, including weighted transients, projected to the year(s) of startup of the nuclear power plant or plants that might be constructed on the proposed site (such date or dates reflecting the term of the ESP) and projected over the lifetime(s) of the plant or plants, to determine the population density in persons per square mile as a function of distance from the plant site out to 20 miles. Compare results to the safety assessment plot of population density vs distance (Reference 3, Section 2.1.3.6). If the population density, including weighted transient population, projected at the time of initial operation exceeds 500 persons per square mile averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the area at that distance), or the projected population density over the lifetime of the facility exceeds 1,000 persons per square mile averaged over any radial distance out to 20 miles, a memorandum should be prepared advising appropriate staff personnel that an evaluation of alternative sites having lower population densities will be needed.

Determine that the safety assessment includes a map of the low population zone and a table of population distribution which includes transients (Reference 3, Section 2.1.3.4). Determine the method used by the applicant to establish the boundary of the nearest population center (Reference 3, Section 2.1.3.5). Evaluate communities which are closer to the site than the design population center to determine the likelihood that any of them can be projected to 25,000 people within the lifetime of a nuclear power plant or plants of specified type (or falling within a PPE) that might be constructed on the proposed site (plus the term of the ESP). Compare the population center distance to the distance to the outer boundary of the low population zone and establish that the population center distance is at least one and one third times the low population zone distance as required by 10 CFR Part 100.

Population and population density data of specific towns and cities within the low population zone can be checked against population data as contained in the Department of Commerce publication, "2000 Census of Population - Characteristics of the Population," or other Census Bureau publications and data sets.

Determine that the current and projected population data for the LPZ includes transients (e.g., workers, occupants of schools, hospitals, etc., recreational facilities).

Determine that the closest population center distance is at least one and one-third times the distance to the outer boundary of the low population zone. Evaluate the characteristics of the land area between the site and the nearest population grouping which has, or is projected to have during the lifetime of the nuclear power plant or plants that might be constructed on the proposed site (plus the term of the ESP), a population of about 25,000. Use whatever data are available on land use, land use controls such as zoning, potential for growth, or factors which

are likely to limit growth between the population grouping and the plant site to determine the potential growth in population density toward the site. The population center boundary should be established at that point nearest the plant site where, in the reviewers judgment, the population density may grow to a value comparable to the density of the community itself. Population density is the controlling criteria, and in this regard, the corporate boundary of the community itself is not limiting. The detail to which this aspect of the site is reviewed will depend on the distance of the nearest probable population center relative to the distance to the outer boundary of the low population zone (Refs. 4 and 5). Where a very large city is involved, a greater distance than the one and one-third factor may be necessary, and appropriate additional compensating engineered safeguards may be necessary. These will be evaluated on a case-by-case basis, and where appropriate, a memorandum should be prepared by SPSB providing any recommendations.

#### IV. EVALUATION FINDINGS

The reviewer verifies that sufficient information has been provided, and that the evaluation is sufficiently complete and adequate to support conclusions of the following type, to be included in the staff safety evaluation report (SER):

As set forth above, the applicant has provided an acceptable description and safety assessment of the site which contains present and projected population densities which, at the early site permit (ESP) stage, are within the guidelines of Position C.4 of Regulatory Guide 4.7, and the applicant has properly specified the low population zone and population center distance. In addition, the staff has reviewed and confirmed, by comparison with independently obtained population data, the applicant's estimates of the present and projected populations (including transients) surrounding the site. Therefore, the staff concludes that the population data provided are acceptable and meet the requirements of 10 CFR 52.17 and 10 CFR Part 100.

The SPSB and IEPB shall determine (and document in Section 15.0 of the SER) that the radiological consequences of bounding design basis accidents at the outer boundary of the low population zone meet the requirements of 10 CFR 52.17 and 52.18. (Section 15.0 of this review standard provides guidance for this determination.)

#### V. IMPLEMENTATION

The following is intended to provide guidance to applicants and licensees regarding the NRC staff's plans for using this section of this review standard.

This section will be used by the staff when performing safety evaluations of ESP applications submitted by applicants pursuant to 10 CFR Part 52 (Ref. 6). Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used by the staff in its evaluation of conformance with Commission regulations.

Implementation schedules for conformance to parts of the method discussed herein are contained in the referenced regulatory guides and NUREGs.

VI. REFERENCES

1. 10 CFR Part 100, "Reactor Site Criteria."
2. Regulatory Guide 4.7, "General Site Suitability for Nuclear Power Stations," Revision 2 (1998)
3. Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," Revision 3 (1978).
4. NUREG-0308, Safety Evaluation Report, Arkansas Nuclear One, Unit 2. November 1977 and supplements.
5. NUREG-75/054, Safety Evaluation Report, Pilgrim Nuclear Generating Station, Unit 2. June 1975 and supplements.
6. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."